

## **De-Risking Source Presence in Frontier Basins by Combining Sea Surface Slicks and Seismic Cross Sections**

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### **ABSTRACT**

Supporting the source component of hydrocarbon play concepts in frontier basins is problematic without well control;- something that by definition frontier basins are lacking. Source maturity models often involve an unsatisfactory margin of error and proposed source intervals are often deep or difficult to resolve confidently with seismic imaging. The observation of hydrocarbon seeps as oil slicks at the sea surface provides direct evidence of a mature hydrocarbon source rock. When combined with existing seismic derived evidence and basin modelling predictions it can significantly increase the confidence of the source component of hydrocarbon play concepts. We have performed seep to seismic correlation studies over a range of geological settings in marine frontier basins worldwide. These studies have been used to predict the geological factors that favour a successful application of this procedure, including what geologic, meteorological and oceanographic (met-ocean) factors affect the success of the results, and how the reliability of the study can be affected by its methodology. When slick detection is combined with interpretation of seismic (showing surface faults, pock-mark and fluid escape features), some of the uncertainty on the quality of the slick is reduced. New frontier basin analysis can be performed quicker, with higher confidence. Examples from Mexico and the Western Mediterranean have been critically evaluated to discuss the effects of regional halite seals and diapirism on seep distributions. The principles driving these trends can be applied to other basins with similar halite characteristics to fast track analysis in new locations. In Ireland and Croatia parallels are drawn between the relationships of shelf / basin geometry and seep distributions that allow the identification of local and regional source kitchens. This allows existing basin models to be validated more confidently. Using a targeted technological approach, it is possible to yield successful results in the challenging met-ocean conditions offshore Somalia; where seep evidence could have significant consequences for regional prospectivity. Finally, in the UK an as-yet undescribed high confidence sea surface slick cluster has been identified, which could have implications for source presence and maturity over the Mid North Sea High. These examples together illustrate both the methodology and value of the technique, and how it can be used to de-risk hydrocarbon source.